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## DESCRIPTION

## BOTTOM OPENING TYPE CONTAINER

## Technical Field

[0001] The present invention relates to a container for accommodating and conveying bulk cargoes such as soil, scraps or the like, and in particular to a bottom opening type container where a bottom plate is arbitrarily opened/closed according to only winding-up/winding-down action of a crane by performing a simple operation so that its content can be discharged.

## Background Art

[0002] In a portal crane such as an unloader equipped on a wharf, a grab bucket catches and lands coals or soil from a hold is used. Ascending/descending and opening/closing of this grab bucket can be performed by a remote control from an operator cab of the crane, but this operation can be made only a grab bucket mounted to a crane through a wire rope and the bucket itself can not be moved to another place. Also, steel materials, scraps or the like can be moved and loaded by a lifting magnet, but there is a drawback that, in a case of stacked materials, only a material close to a surface of the stacked materials can be sucked. Therefore, the most efficient and universal cargo handling means comprises a container (bag). However, in a case of the container, much time is required for loading and discharging, which results in inefficiency. Therefore, such a container whose bottom wall can be opened and closed freely and where the bottom plate is opened by a simple operation, for example, releasing a lock to discharge the content is often used. However, there occurs such a case that a worker who performs opening/closing operation of the container bottom plate when the content is discharged can not be viewed from an operator of a crane or the worker is injured by discharged materials falling off, which poses a problem about safety. For this reason, some containers which is prepared in advance such that its bottom plate is automatically opened when the container is rolled down and it is rolled up again after landed and which does not require a worker to exist near to the

container at a time of discharging the content have been proposed.

[0003] As one example, a container described in Japanese Patent Application Laid-Open No. 06-115869 publication will be explained with reference to the drawings. Fig. 9 is a front view of this container, and Fig. 10 is a plan view thereof, where 1 denotes a container, 11 (11a, 11b) denotes double-leafed hinged type bottom plates, 12 denotes opening and closing shafts of the bottom plates 11, 13 denotes side plates of the container 1, 91 denotes an engaging rod which engages opening and closing of the bottom plates 11, 92 denotes a pin which is attached to a tip portion of at least one of the bottom plates 11a, 11b so as to be engaged with a lower end portion of the engaging rod 91, 93 denotes an ascending and descending block formed at an upper end of the engaging rod 91, 94 denotes cam pieces supporting the ascending and descending block 93, 95 denotes a guide groove along the ascending and descending block 93 ascends and descends, 941 denotes shafts about which the cam pieces 94 rotate, 96 denotes springs which urge the cam pieces 94 so as to be opened outward, 97 denotes springs lifting the bottom plates 2, 98 denotes guide piece which is positioned slightly below the ascending and descending block 93 of the engaging rod, and ascends and descends within the guide groove 95 like the ascending and descending block 93, and 99 denotes a stopper functioning such that the guide piece 98 does not lower below a predetermined height.

[0004] In this container 1, the bottom plates 11a, 11b can be opened and closed from the vicinity of a central portion in a double-leafed hinged manner about the opening and closing shafts 12 provided in the vicinity of the both lower ends of the side plates 13. The pin 92 attached to at a tip end of one of the bottom plates, for example, the bottom plate 11a is engaged with a lower end of the engaging rod 91. Also, the other bottom plate 11b is engaged by the one bottom plate 11a. When the ascending and descending block 93 is put in a state where it is placed on an upper face of the cam piece 94, the cam piece 94 can not be rotated because it is pressed by the ascending and descending block 93, and the engaging rod 91 holds this state. For this reason, the bottom plates 11a, 11b are maintained such that their tip ends are lowered than the lower edges of the side plates 13 by h.

[0005] When the container 1 is landed on a flat face and the engaging rod 91 is pushed up

by the self-weight of the container 1, the ascending and descending block 93 is floated up to open the cam pieces 94, so that the cam pieces 94 are rotated about the shafts 941 by the springs 96 to be opened. In this state, when the container 1 is lifted up, the ascending and descending block 93 moves along the guide groove 95 without being prevented by the cam pieces 94, and the bottom plates 11 are opened due to the weight of the content and the self-weights of the bottom plates 11 so that the content is discharged.

[0006] That is, when the container 1 is lifted up after it is lifted down up to a predetermined position and once landed, the bottom plates 11 open automatically to discharge the content.

[0007] In this manner, the container described in Japanese Patent Application Laid-Open No. 06-115869 publication can open the container bottom plates to discharge the content by only lifting-up and lifting-down operations conducted by a crane. However, in this container,

there is a problem a) that, since a clearance of a length  $h$  in a height direction is required in a bottom plate portion, the content may drop due to its nature;

a problem b) that, once the container is landed, the bottom plates are opened in any case, and the like.

[0008] An object of the present invention is to provide a bottom opening type container which solves such a problem, and where the bottom plates can be tightly closed without providing a clearance and where a selection about whether or not the bottom plates should be opened automatically can arbitrarily be made by a simple operation.

#### SUMMARY OF THE INVENTION

[0009] (1) A bottom opening type container which is constituted with a side plate (13) and a pair of bottom plates (11), comprising: opening and closing shafts (12) of the bottom plates (11) which are mounted in the vicinity of a bottom portion of the side plate (13); engaging pins (14) which are provided in the vicinity of tip ends of the bottom plates (11); a pair of opening and closing arms (57) which are pivoted to opening and closing fulcrums (573) fixed to the side plate (13) and can retain the engaging pins (14) at lower end portions; intermediate links (56) whose one ends are coupled to upper and intermediate

portions of the opening and closing arms (57); a block (55) which is connected to the other ends of the intermediate links (56); a lifting rod (52) which is screw-coupled to the block (55); a sleeve (53) which is inserted with the lifting rod (52); a rocker arm (54) which is mounted in the vicinity of a lower end of the sleeve (53) and which ascends and descends together with the sleeve (53); a lifting-up arm (51) which is coupled to the lifting rod (52) via a pin (521); a manual lever (53) which is inserted between the lifting-up arm (51) and an upper end of the sleeve (53) to be rotatable by 180° in a horizontal direction using the lifting rod (52) as a rotation shaft; and a stopper for a lever (58) which is provided at a lower portion of the manual lever (53) to prevent the manual lever from lowering, wherein the vicinities of both ends of the rocker arm (54) are engaged with upper end portions of the opening and closing arms (57), the lifting-up arm (51) has one short arm and one L-shaped arm on both sides about the pin (521) serving as a rotation center, a pushing-down pin (513) is provided near to the rotation center of the short arm and a lifting hole (511) is provided at a tip end of the L-shaped arm, and S-shaped slits (571) which are fitted to the rocker arm (54) in left and right directions at respective positions of opening and closing are provided in the opening and closing arms (57).

[0010] (2) A bottom opening type container which is constituted with a side plate (13) and a pair of bottom plates (11), comprising: opening and closing shafts (12) of the bottom plates (11) which are mounted in the vicinity of a bottom portion of the side plate (13); engaging pins (14) which are provided in the vicinity of tip ends of the bottom plates (11); a pair of opening and closing arms (57) which are pivoted to opening and closing fulcrums (573) fixed to the side plate (13) and can retain the engaging pins (14) at lower end portions; intermediate links (56) whose one ends are coupled to upper and intermediate portions of the opening and closing arms (57); a block (55) which is connected to the other ends of the intermediate links (56); a lifting rod (52) which is screw-coupled to the block (55); a sleeve (53) which is inserted with the lifting rod (52); a rocker arm (54) which is mounted in the vicinity of a lower end of the sleeve (53) and which ascends and descends together with the sleeve (53); and a lifting-up arm (51) which is coupled to the lifting rod (52) via a pin (521), wherein the vicinities of both ends of the rocker arm (54) are engaged with upper end portions of the opening and closing arms (57), the lifting-up arm (51) has

two arms extending in different directions by 90° about the pin (521) serving as a rotation center, lifting holes (511), (512) are provided at respective holes, a pushing-down pin (513) is mounted near to the rotation center of one arm, and S-shaped slits (571) which are fitted to the rocker arm (54) in left and right directions at respective positions of opening and closing are provided in the opening and closing arms (57).

[0011] (3) A bottom opening type container according to claim 1 or 2, wherein a returning mechanism constituted by rotatably mounting the other end of a lever (6) having a tip end hook (61) to a side face of the bottom plate (11) and lifting an intermediate portion of the lever by a spring (62) is provided, the tip end hook (61) is engaged with the lifting-up arm (51) in a state where the bottom plate (11) has been opened at 90° and the lifting-up arm (51) has fallen down without being lifted upward.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0012] Fig. 1 is a front view showing a state where bottom plates of a bottom opening type container of a first embodiment of the present invention has been closed;

[0013] Fig. 2 is a front view showing a state where the bottom plates of the bottom opening type container of the first embodiment of the present invention has been opened;

[0014] Fig. 3 is a partial front view showing an opening and closing control mechanism in the first embodiment of the invention;

[0015] Fig. 4 is a partial front view showing the opening and closing control mechanism in the first embodiment of the present invention;

✓ [0016] Figs. 5<sup>a, b</sup> are partial front views showing a main portion of the opening and closing control mechanism in the first embodiment of the present invention;

[0017] Fig. 6 is a partial front view showing an opening and closing control mechanism in a second embodiment of the present invention;

[0018] Fig. 7 is a partial front view showing the opening and closing control mechanism in the second embodiment of the present invention;

✓ [0019] Figs. 8<sup>a-d</sup> are front views showing an operation of a returning mechanism in a third embodiment of the present invention;

[0020] Fig. 9 is a front view of a bottom opening type container showing a conventional

art; and

[0021] Fig. 10 is a plan view of the bottom opening type container showing the prior art.

#### DESCRIPTION OF THE INVENTION

[0022] A bottom opening type container of the present invention is not lifted up directly when it is lifted up by a crane or the like, but it is configured such that a lifting-up rod for lifting up a container can be ascended and descended relative to a container side plate and bottom plate receiving links provided at a lower end portion of the lifting-up rod restrain engaging pins positioned at tip ends of a container bottom plates from the below, the engaging pins are released only when the lifting-up rod is lowered relative to the side plate by an opening and closing mechanism so that the bottom plates can be opened. Therefore, when a releasing operation is performed, the bottom plates are released by landing the container so that the content is discharged, and when the releasing operation is not performed, the cargo handling can be performed while the bottom plates are closed.

[0023] Alternatively, a portion to be lifted up by a crane is constituted by a lifting-up arm which has two arms and is rotatable by 90°, and the bottom plates are put in a closed state when the container is lifted up by one arm, while the bottom plates are put in a locked state when the container is lifted up by the other arm, so that opening and closing are controlled by changing the lifting-up state.

[First Embodiment]

[0024] A first embodiment of the present invention will be explained with reference to the drawings. Fig. 1 is a front view showing a state of a bottom opening type container 1 whose bottom plates have been closed, and Fig. 2 is a front view showing a state of the bottom opening type container whose bottom plates have been opened, where the same reference numerals are used to parts common to Figs. 9 and 10, and 5 denotes an opening and closing mechanism for the bottom plates 11, 51 denotes a lifting-up arm 51, 531 denotes a manual lever, 572 denotes engaging hook which opens and closes according to operation of the manual lever 531 and action of the opening and closing control mechanism 5 described later to retain the bottom plate 11, and 14 denotes an engaging pin provided at a tip end portion of the bottom plate 11 retained by the engaging hook 572.

[0025] As understood from Fig. 1, the bottom plates 11 of the container are approximately completely closed by engaging the engaging pins 14 with the engaging hooks 572, and it is unnecessary to provide such a clearance as viewed in Fig. 9 and described above.

[0026] Next, the opening and closing control mechanism 5 will be explained. Figs. 3 and 4 are front views which show the opening and closing control mechanism 5 in different states, respectively, according to the embodiment. The same reference numerals are used in parts common to the above-described embodiment. 51 denote a lifting-up arm which is engaged with a hook when the container is lifted up by a crane or the like, 52 denotes a lift rod which is coupled to the lifting-up arm 51 via a pin 521, 53 denotes a sleeve in which the lifting rod 52 is inserted, 54 denotes a rocker arm which is mounted in the vicinity of a lower end of the sleeve to ascend and descend together with the sleeve, 55 denotes a block which is fixed to the vicinity of the lower end of the lift rod 52 through a screw connection, 56 denotes an intermediate link whose one end is connected to the block 55, and 57 denotes an opening and closing arm which is connected to the other end of the intermediate link 56. A spring 532 is inserted between a lower end of the sleeve 53 and the block 55, and the manual lever 531 which is rotatable by 180° in a horizontal direction using the lifting rod 52 as a rotation shaft is inserted between an upper end of the sleeve 53 and the lifting arm 51. Further, an extension portion 522 of the lifting rod 52 is screwed into the block 55 from the below and it is inserted into a hole of a protrusion piece 13a in the vicinity of a container bottom portion so that the protrusion piece serves as a guide when the lifting rod 52 ascends and descends. The opening and closing arm 57 is rotatable about an opening and closing fulcrum 573 provided on the container bottom portion. In a state where the lower end engaging hook 572 is positioned vertically, as shown in Fig. 3, the hook engages the engaging pin 14 mounted to the bottom plate 11 of the bottom opening type container from the outside so that the hook maintains the bottom plate so as not to open. Further, an upper end portion of the opening and closing arm 57 is provided with a S-shaped slit 571 and it is engaged with a tip end portion of the above-described rocker arm 54 via a lock pin 541, and an upper and intermediate portion thereof is connected with the other end of the intermediate link 56, as described above.

[0027] The lifting arm 51 has one short arm and one L-shaped arm on both sides of a pin

521 serving as a rotation center, and a pushing-down pin 513 is provided near to the rotation center of the former arm and a lifting hole 511 is provided at a tip end of the latter arm.

[0028] In Fig. 3, the manual lever 531 is positioned on the left side. The manual lever 531 is prevented from being lowered beyond this position by a stopper for a lever 58 mounted to a fixed portion or the like such as a container 1 main body or the like. For this reason, even when the container 1 is tried to be lifted up by engaging lifting-up means such as a lifting-up wire of a crane or the like with a lifting hole 511, the lifting arm 51 does not rotate. Also, the sleeve 53 is maintained at a raised position relative to the lifting rod 52. Therefore, the engaging hooks 572 are prevented from opening and the container is lifted while the bottom plates are closed.

[0029] Next, in Fig. 4, the manual lever 531 has been rotated by 180° to the right side by operating the manual lever 531. In this state, when the lifting hole 511 is engaged with the lifting-up means such as the lifting-up wire of the crane or the like to lift up the container 1, the lifting-up arm 51 is rotated because the manual lever 531 has been released from the stopper for a lever 58, so that the manual lever 531 is pushed down by the pushing-down pin 513 and further sleeve 53 is pushed down.

[0030] Since the block 55 is pushed down by this action, the upper portions of the opening and closing arms 57 are drawn inwardly by the intermediate links 56, the engaging hook portions 572 at lower ends are opened outward and the engaging pines 14 are released so that the bottom plates can be opened.

[0031] Figs. 5 are explanatory diagrams showing the rocker arm 54 and the upper portions of the opening and closing arms 57, which correspond to opened and closed states of the opening and closing arms 57, that is, Fig. 5(a) corresponds to Fig. 3 and Fig. 5(b) corresponds to Fig. 4. The S-shaped slit 571 is provided at the upper portion of the opening and closing arm 57. In each of states where both end portions of the S-shaped slit 571 are respectively opened and closed, the lock pin 541 provided at the tip end of the rocker arm 54 is pushed on the slit so that the state at that time can be maintained. Therefore, working is performed such that the orientation of the slit relative to the lock pin 541 becomes vertical in each of the opened and closed states. It is preferable that a



portion of the lock pin 541 which comes in contact with the slit is processed in a flat state.

[0032] Since the opening and closing control mechanism 5 of this embodiment has been configured in the above manner, one example of how to use the container will be explained as follows:

[0033] As shown in Fig. 3, the manual lever 531 is moved at the "Close" position on the left side, and even if the container is lifted up by using the lifting hole 511 to be moved or lifted down, the bottom plates do not open. The container is once landed and the manual lever 531 is rotated by 180° to be moved to the "Open" position on the right side, and when the container is lifted up and it is landed again, the bottom plates open so that the content is discharged. After the cargo is charged, when the empty container is landed again and the manual lever 531 is returned back to the close position, a cargo handling work can be performed with the container whose bottom plates have been closed, again.

[0034] In a case of this embodiment, when the manual lever 531 is moved to the "Close" position, the bottom plates of the container are prevented from opening, and all operations of lifting-up and lifting-down, a transverse movement, and opening and closing of the container can be performed by only operations in the crane, so that it is unnecessary to approach to a lifted cargo which is dangerous for a worker. In addition, since it can be confirmed clearly from a far position that the manual lever 531 is positioned at the "Close" position, all workers around the cargo can work safely.

[Second Embodiment]

[0035] A second embodiment of the present invention will be explained with reference to the drawings. Since a bottom opening type container itself is similar to that of the first embodiment, and there are many points common to the first embodiment regarding the opening and closing control mechanism, this embodiment will be explained mainly regarding different points below. Figs. 6 and 7 are front views showing an opening and closing control mechanism in different states, respectively, according to the embodiment. Same reference numerals will be used for parts common to parts which have been explained previously.

[0036] 51 denotes a lifting-up arm to which a hook is applied when the container is lifted up by a crane or the like. In this embodiment, the lifting-up arm 51 has two arms

extending in different directions at an angle of  $90^\circ$  to each other about a pin 521 serving a rotation center, lifting holes 511 and 512 are provided in the respective arms, and a pushing-down pin 513 is provided near to the rotation center of the one arm.

[0037] In Fig. 6, the lifting hole 511 on the side where the pushing-down pin 513 is mounted is intended to be used for lifting. In this case, the pushing-down pin 513 is positioned at an ascended position and the sleeve 53 is positioned at an ascended position relative to the rod 52.

[0038] Next, in Fig. 7, the other lifting hole 512 of the lifting-up arm 51 is lifted up. In this case, the lifting-up arm 51 rotates by  $90^\circ$  and the pushing-down pin 513 is pushing down the head portion of the sleeve 53.

[0039] Since the block 55 is pushed down by this action, the upper portions of the opening and closing arms 57 are drawn inward by the intermediate links 56, and the engaging hook portions 572 at lower end are opened outward, so that the engaging pins 14 are released. Thereby, the bottom plates can be opened.

[0040] One example of how to use a container using the opening and closing control mechanism 5 structured above will be explained as follows:

[0041] As shown in Fig. 6, in a case that the container is lifted up using the lifting hole 511 on the side where the pushing-down pin 513 is provided, the bottom plates do not open even when movement or lifting-down of the container is performed. After the container is once landed and a hook of the crane is reattached to another lifting hole 512, when the container is lifted up again and landed, the bottom plates are opened so that the content is discharged. After discharging, the empty container is landed again and the hook is reattached to the other hole so that cargo handling work can be performed with the container whose bottom plates have been closed, again.

[0042] In this case, opening and closing of the bottom plates 11 of the container can be controlled by selecting one of the two lifting holes 511 and 512 so that such an accident as erroneous opening of the bottom plates 11 can be prevented substantially securely. In addition, all operations of lifting-up and lifting-down, a transverse movement, and opening and closing of the container can be performed by only operations in the crane, so that it is unnecessary to approach to a lifted cargo which is dangerous for a worker.

[Third Embodiment]

[0043] Next, a third embodiment of the present invention will be explained with reference to Fig. 8. Since this embodiment does not relate to the opening and closing control, the opening and closing control mechanism shown in the embodiment 1 or 2 may be used as the opening and closing control mechanism 5.

[0044] In case that articles to be conveyed are rectangular timbers or the like, it is easy to discharge the content from a container where bottom plates 11 are completely opened at an angle of 90°. However, in a case that the bottom plates 11 are opened at an angle of 90°, the bottom plates 11 can not be closed by merely lifting up the container 1 when the bottom plates 11 should be closed again. For this reason, there is a problem that a worker must assist closing of the bottom plates by performing some operations and the worker must approach to a lifted cargo, which involves a danger. This embodiment is for solving this point and a returning mechanism is provided in at least one of the bottom plates 11.

[0045] The returning mechanism is structured by rotatably mounting another end of one lever 6 having a tip end hook 61 to a side face of the bottom plate 11 and hanging an intermediate portion of a spring 62 for tension. The size of the lever 6 is set to have such a length that the tip end hook 61 is engaged with the lifting-up arm 51 in a state where the bottom plate 11 is opened at an angle of 90° and the lifting-up arm 51 is fallen down without being lifted upwardly.

[0046] As shown in Fig. 8(a), when the bottom plates 11 are put in a closed state, the lever 6 is pulled to a standing state by a spring 62 so that the tip end hook 61 is put in an idle state. As shown in Fig. 8(a), when the bottom plates 11 are opened to discharge the content from the container by operating the opening and closing control mechanism 5, the lever 6 is pulled up and the spring 62 is also made inactive, so that the lever 6 is fallen towards the opening and closing control mechanism 5.

[0047] As shown in Fig. 8(c), the container 1 lands in a state that the bottom plates 11 have been opened at an angle of 90°. When lifting-up means W is released or loosened, the lifting-up arm 51 falls down and the tip end hook 61 of the lever 6 is engaged with the lifting-up arm 51. Next, when the lifting-up means W is lifted up again, the lifting-up arm 51 stands up and the lever 6 draws the bottom plate 11 near to achieve the state shown in

Fig. 8(d), so that, when the container is landed again, the bottom plates 11 are closed by its own weight. As a result, the bottom plates 11 of the container can be closed by only operation of the crane without assistance of a worker.

[0048] Incidentally, in a case that articles to be handled are bulk cargoes and the content can be discharged completely without opening the bottom plates 11 of the container up to an angle of 90°, this returning mechanism is not required.

#### Industrial applicability

[0049] According to the present invention, bottom plates of a container can be tightly closed without providing a clearance, one of automatic opening and closing can arbitrarily be selected by a simple operation, and this operation can be made at a safe place in advance. Furthermore, in the present invention, since a container is structured such that the bottom plates are opened at an angle of 90° and they can be closed without touching the container directly, such an excellent effect can be developed that articles other than bulk cargoes can be conveyed, and high efficiency of a cargo handling work and improvement of safety can be achieved.